

## VERTICALLY ADJUSTABLE CHAIR ARMREST

### BACKGROUND OF THE INVENTION

#### Cross Reference To Priority Applications

[0001] Not applicable.

#### Statement Regarding Federally Sponsored Research

[0002] Not applicable.

#### Field of the Invention

[0003] The present invention relates to a vertically adjustable armrest for a chair and more particularly, to a vertically adjustable armrest for an office chair, the armrest being capable of easily and precisely adjusting upwardly and downwardly while being simply constructed and relatively inexpensive.

#### Description of the Related Art

[0004] Most modern office chair armrests are vertically adjustable. See, for example, several patents: U.S. 6,398,309; U.S. 5,853,223; U.S. 5,324,096; and EP 1258209. While these patents disclose adjustable armrests, the armrest mechanism may be unreliable, difficult to use and/or relatively expensive.

### BRIEF SUMMARY OF THE INVENTION

[0005] The objectives encountered with previous devices have been overcome by the present invention. What is described here is a vertically adjustable armrest assembly for a chair comprising a support connected to the chair and extending generally in a vertical direction, the support having an open top, a plate connected to the interior wall of the support, the plate having

a series of vertically aligned openings, and a slide element for supporting an armrest, the slide element being disposed within the support and extending out of the open top, and being positioned adjacent the plate, and having a lateral opening. The armrest assembly also includes a laterally movable block for being selectively received in the openings of the plate, a rod extending generally parallel to the slide element, the rod having a handle at an upper portion thereof and a misaligned portion, the misaligned portion operatively connected to the block for selectively moving the block into and out of openings in the plate, and a biasing element connected to the rod for maintaining the rod in a predetermined position.

[0006] There are number of advantages, features and objects achieved with the present invention which are believed not to be available in earlier related devices. For example, two advantages of the present adjustable armrest invention are that the adjustable armrest is simply constructed and relatively inexpensive. Two other features of the present armrest invention are that the armrest is reliably operated, easy to use and very robust. Other objects of the present invention are the provision of an armrest which is easily and quickly assembled and thereby is cost effective.

[0007] A more complete understanding of the present invention and other objects, advantages and features thereof will be gained from a consideration of the following description of a preferred embodiment read in conjunction with the accompanying drawing provided herein. The preferred embodiment represents an example of the invention which is described here in compliance with Title 35 U.S.C. section 112 (first paragraph), but the invention itself is defined by the attached claims.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

- [0008] FIGURE 1 is an isometric view of an office chair with vertically adjustable armrests.
- [0009] FIGURE 2 is an exploded isometric view of one of the vertically adjustable armrest assemblies.
- [0010] FIGURE 3 is another exploded isometric view of the armrest assembly shown in FIG. 2 rotated about 90 degrees.
- [0011] FIGURE 4 is a front elevation view of an armrest assembly.
- [0012] FIGURE 5 is a front elevation view of a notched plate.
- [0013] FIGURE 6 is a side elevation view of the notched plate.
- [0014] FIGURE 7 is a front elevation view of a slide element.
- [0015] FIGURE 8 is a rear elevation view of the slide element.
- [0016] FIGURE 9 is an enlarged front isometric view of a portion of the slide element.
- [0017] FIGURE 10 is a rear isometric view of the portion of the slide element shown in FIG. 8.
- [0018] FIGURE 11 is a front elevation view of an operating rod.
- [0019] FIGURE 12 is a side elevation view of the operating rod.
- [0020] FIGURE 13 is a rear elevation view of the operating rod.
- [0021] FIGURE 14 is an enlarged isometric view of a block.

[0022] FIGURE 15 is a sectional elevation view of the block.

[0023] FIGURE 16 is a sectional elevation view of the armrest in a locked position.

[0024] FIGURE 17 is a sectional elevation view of the armrest in an unlocked position.

#### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

[0025] While the present invention is open to various modifications and alternative constructions, the preferred embodiment shown in the various figures of the drawing will be described herein in detail. It is understood, however, that there is no intention to limit the invention to the particular embodiment, form or example which is disclosed here. On the contrary, the intention is to cover all modifications, equivalent structures and methods, and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims, pursuant to Title 35 U.S.C. section 112 (second paragraph).

[0026] Referring now to FIG. 1, there is shown an office chair 10 having adjustable armrests. The chair includes a base 12, a pedestal 14, a frame assembly 16, a seat assembly 18, a back assembly 20, a pair of adjustable armrests 22, 24 and control levers, such as control lever 26.

[0027] The simplicity of the adjustable armrest may be appreciated by referring to FIGS. 2-4. The armrest assembly 22 includes a support tube 30 connected to the frame assembly 16, a vertical adjustment slide 32, a notched plate 34, an operating rod 36, a lock block 38 and a spring 40. The vertical adjustment slide 32 acts as a mounting member and is formed with an upper base 42. Slidably mounted to the upper base 42 is a lower slide element 44, slidably mounted to the lower slide element 44 is an upper slide element 46, and attached to the upper slide element 46 is an armrest cover 48.

[0028] Reference is made to co-pending patent applications assigned to the same assignee as the present application and entitled *Horizontally Adjustable Chair Armrest*, Application No. \_\_\_\_\_, filed \_\_\_\_\_ (Docket No. 087522-785329); *Chair with Backward and Forward Passive Tilt Capabilities*, Application No. \_\_\_\_\_, filed \_\_\_\_\_ (Docket No. 087522-785323); *Chair Back*, Application No. \_\_\_\_\_, filed \_\_\_\_\_ (Docket No. 087522-785336); *Chair with Adjustable Seat Back*, Application No. \_\_\_\_\_, filed \_\_\_\_\_ (Docket No. 087522-785349); and *Tilt Lock Mechanism*, Application No. \_\_\_\_\_, filed \_\_\_\_\_ (Docket No. 087522-785350). These applications disclose other features of the chair. This disclosure here, and the disclosure *Horizontally Adjustable Chair Armrest* illustrate the range of movement of the armrests. All disclosure of the Applications just mentioned are incorporated herein by reference. It is to be appreciated that a chair armrest may be fixed vertically and only adjustable horizontally, or fixed horizontally and adjustable vertically, or the vertical adjustment assembly disclosed here may be used with a horizontal adjustment assembly different from that disclosed in Application No. (087522-785329).

[0029] The support tube 30 includes an open top 50 and two lateral openings 52, 54 in one of the side walls 56 and the tube receives the vertically adjustable slide 32 and the stationary notched plate 34.

[0030] The notched plate 34, FIGS. 2, 3, 5 and 6, includes a plurality of aligned openings or notches, such as the opening 58. The notched plate 34 also includes two cylindrical posts 59, 60 which are received by the lateral openings 52, 54 in the wall of the support tube. Fasteners, not shown, attach the support tube and notched plate to the frame assembly 16 by extending into the posts. The notched plate 34 also includes two wing tabs 61, 62 for limiting vertical movement of the slide 32 by engaging tabs 63, 64, FIG. 8, on the slide 32. At the upper portion of the notched

plate is a head portion 65 integral with the remainder of the plate by a thin neck portion 66.

Three small guides 67, 68, 69 are formed on the head portion. A spring 70 is retained by the small guides and when assembled has one end bearing against the wall 56 of the support tube 30 and the other end bearing against the head portion 65. The thin neck portion provides flexibility to the head portion 65 and allows the head portion to press against the adjustable slide 32. This arrangement provides a tighter and consistent feel to the armrest and offers compensation for variations in manufacturing tolerances.

[0031] The adjustment slide 32 includes a longitudinally extending stem 72, FIGS. 7-10, and the upper base 42. The stem 72 includes an elongated upper slot 74 and a lateral opening 75 having a cross shaped front 76 and an inverted "T" shaped rear 78. The stem 72 also includes a lower slot 79, a spring retainer lateral wall 80 and a slanted abutment wall 82. The elongated upper slot 74 and the cross shaped lateral opening 75 are structured to receive and guide the rod 36 which moves vertically in the upper slot. The support tube 30 acts as a guide for the adjustable slide 32, and the lateral opening 75 acts as a guide for the block 38.

[0032] The operating rod 36, FIGS. 11-13, is an elongated element having an upper handle 88 and a lower misaligned or triangular portion 90 having a "T" shaped cross section. The rod also includes an upper guide head portion 91 and a bottom projection 92 for mounting the spring 40. The handle 88 allows a user of the chair to move the rod against the spring 40, which is trapped between the projection 92 of the rod 36 and the lateral wall 80 of the slide 32. The triangular portion includes a front cam surface 93 and a rear cam surface 94. These surfaces are slanted at about fifty four degrees from a horizontal reference line 95. The rod also includes an abutment surface 96. The upper guide head portion 91 is received by an opening 97, FIG. 2, in the upper base 42.

[0033] Slidably mounted within the lateral opening 75 of the slide 32 is the horizontally movable block 38. The block includes an opening 98, FIGS. 14 and 15, through which the rod 36 extends. Engaging the cam surfaces 93, 94 of the rod 36 are internal front surface 100 and internal rear surface 102 of the block 38. These surfaces are cam followers. The block also includes a nose portion 106 which is selectively received by the notches in the notched plate 34.

[0034] Referring now to FIGS. 16 and 17, the block 38 is shown in the opening 58 of the notched plate 34 in FIG. 16. When the block is inserted in one of the plate openings, the armrest is in a locked position. When the block is moved out of one of the openings, as shown in FIG. 17, then the armrest may be vertically adjusted.

[0035] Moving the block 38 horizontally into and out of the notched plate openings is accomplished by moving the rod 36 in a vertical direction by the rod handle 88. When in a locked condition, the front cam surface 93 of the rod bears against the front cam follower surface 100 of the block. When the rod is raised (FIG. 17), the spring 40 is compressed and the rear cam surface 94 of the rod bears against the rear cam follower surface 102 of the block and slides the block away from the notched plate 34 so as to disengage the block from the plate openings.

[0036] In this manner, the adjustment slide 32 is free to move vertically and the armrest may be vertically adjusted by lifting or depressing the armrest cover. Once a new vertical height is satisfactorily achieved, a chair user merely releases the rod handle 88. The spring 40 expands and causes the rod to cam or push the block back into engagement with the appropriate notched plate opening. More specifically, the front cam surface 93 of the rod bears against and pushes on the front cam follower surface 100 of the block. Even though these surfaces are slanted, it is well understood that a horizontal component of force will move the block horizontally. The

abutment surface 82 of the slide limits the upward movement of the rod 36 because the abutment surface 96 of the rod 36 cannot go any higher than the abutment surface 82 of the slide 32.

[0037] The vertically adjustable armrest is easily and quickly assembled. The notched plate is aligned in the support. The rod may be placed within the opening of the block, the spring is mounted to the rod and then the rod is aligned with the vertical upper slot of the adjustment slide and the block with the lateral opening. Thereafter, the slide, the rod and the block assembly is inserted into the support tube.

[0038] In operation, a chair user sitting on the seat assembly of the office chair may easily adjust the vertical locations of the armrests simply by lifting upwardly on the rod handle against the compressing spring. This disengages the block from the opening in the notched plate and then the armrest may be moved to the desired vertical position. Thereafter, the handle is released causing the spring to bias the rod against the block thereby pushing the block back into engagement with the appropriate opening in the plate. Once engagement is achieved, the armrest is locked in the desired vertical position.

[0039] It can now be appreciated that the adjustable armrest is simply constructed, easy to use, reliable and cost effective. The adjustable armrest is relatively inexpensive and may be easily and quickly assembled.

[0040] The above specification describes in detail a preferred embodiment of the present invention. Other examples, embodiments, modifications and variations will, under both the literal claim language and the doctrine of equivalents, come within the scope of the invention defined by the appended claims. For example, making modifications to the rod and the shape of the opening in the block will still result in an equivalent structure and will also come within the



literal language of the claims. The same holds true for the lateral opening in the slide. Still other alternatives will also be equivalent as will many new technologies. There is no desire or intention here to limit in any way the application of the doctrine of equivalents nor to limit or restrict the scope of the invention.